



## NECK PAIN IN YOUNG ADULTS: IMPACT OF ELECTRONIC DEVICE USE AND OTHER ASSOCIATED FACTORS.

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**ABSTRACT** **Background and objectives:** The use of electronic gadgets like mobile phones and computers has increased in the past decade. These are used widely for communication and occupational activities. Excessive use of these can cause health problems like neck pain and other musculoskeletal disorders. Hence, a study was planned to investigate the risk factors for neck pain and associated symptoms with the use of such gadgets in young adults who used them regularly.

**Materials and methods:** This cross-sectional study was done in a tertiary hospital of a medical college and included young adults of both genders (age 18-35 years) having neck pain and history of regular use of gadgets like mobile and computers. The information regarding the habits of usage of gadgets, physical activity and associated symptoms and disorders was collected. Chi square analysis and multinomial regression analysis was done to detect the risk factors.

**Results:** Neck pain related to the use of electronic gadgets was significantly related to duration of time spent using personal computer (PC) ( $p=0.024$ ), use of PC without moving for more than 1.5 hours ( $p=0.034$ ) and regular use of smart phone (0.033). Headache and loss of concentration were significantly common in students ( $p=0.001$ ) and in users of desktop computer ( $p=0.01$ ). Difficulty in concentration ( $p=0.006$ ) and depression ( $p=0.002$ ) were significantly associated with use of gaming devices. Fatigue was significantly associated with daily use of smartphones for more than 1 hour ( $p=0.029$ ), gaming devices ( $p=0.022$ ) and television (0.02). Dizziness was more common in females ( $p=0.001$ ) and in users of gaming devices ( $p=0.000$ ) and in age group 26-35 years ( $p=0.03$ ).

**Conclusion:** Prevention of neck pain and associated symptoms with the computer and mobile devices is possible by ergonomic corrections, postural health, taking frequent breaks while using PCs and limiting the total hours of usage of mobile devices.

**KEYWORDS :** Neck pain, ergonomics, computer use, musculoskeletal disorders, mobile devices, hand held devices

### INTRODUCTION:

The use of electronic gadgets like computers, television and hand held devices such as mobile phones, tablets, iPods, is on rise in recent years. These are used for communication and entertainment purpose such as media, internet access and gaming. Mobile users can communicate by voice and by a range of text button or touch screen usage by means of short message service, Whats App, Viber, Black Berry Messenger and social networking applications like Twitter, Facebook, etc.

Literature reports an adverse impact on physical and psychological health of users, especially those using hand held devices extensively. The incidence of musculoskeletal disorders (MSD) of hand, forearm, arm and neck has been increasing all over the world due to prolonged forceful, low amplitude and repetitive use of mobile devices.<sup>1,2</sup> The use of computers can also contribute to various types of musculoskeletal disorders.<sup>3,5</sup> Sitting for lengthy periods in fixed postures for operating computers and using hand held devices can result in neck pain, headache, fatigue, dizziness, tension, etc.<sup>1,5</sup>

Hence, a study was planned to identify the risk factors leading to neck pain and other related symptoms with the use of such gadgets.

### MATERIALS AND METHODS:

**Study design:** Cross-sectional study.

**Study setting:** Orthopaedics Out-patient department of MGM Medical College Hospital.

**Study population:** Young adults in the age group 18-35 years attending the out-patient department for complaints of neck pain.

### INCLUSION CRITERIA:

1. Adults of both genders in age group 18-35 years
2. Having history of neck shoulder pain
3. Having history of daily use of either mobile phone, tablets, computers and television or all of them for at least one year.

### EXCLUSION CRITERIA

1. Neck pain due to trauma

2. Neck pain due to infectious etiology
3. Past history of neck pain due to trauma or infectious etiology
4. Congenital deformities of neck, shoulder and upper extremity
4. History of any surgical intervention of cervical spine

**Sample size:** The prevalence of neck shoulder pain in users of electronic devices was 40% as per the survey by Shan et al<sup>6</sup>. Hence the required sample size was 369 using the formula  $N = Z^2 P(1-P)/D^2$ .

**Sampling method:** Convenience sampling method was employed. Patient information sheet was filled by the principal investigator after taking informed consent from the patient.

**Statistical analysis:** The information was first collected in Microsoft Excel sheet and then analysed using Statistical Package for the Social Sciences (IBM Corp. Released 2015, IBM SPSS Statistics for Windows, Version 23.0, Armonk, N.Y., and U.S.A). In order to understand the risk factors associated with neck pain, descriptive statistics were used. The patients with neck pain and other associated symptoms were categorised into two groups –those with less frequent neck pain (those with pain once a month and once a week) and those with more frequent pain (pain 2-3 times a week and more than 3 times a week). The percentages, average values were calculated and chi-square analysis was done followed by multinomial regression analysis. The p value of  $<0.05$  was considered as significant at 95% confidence interval.

**RESULTS:** A total of 402 patients' history was collected regarding the neck pain and associated musculoskeletal discomfort and about their daily habits regarding use of electronic gadgets and hand held devices. All patients were in the age group of 18 to 35 years. The patient's characteristics are summarised in the table 1. Most of the patients were using smartphones (touch screen devices) (85.6%) followed by ordinary mobile phones (40.8%) and gaming devices (27.1%)

**Pain characteristics:** Clinical assessment and history showed that in the majority of the individuals right side was more commonly affected (44.8) when compared to the bilateral (35.8) and left side (19.4) involvement.

Co-morbidities: All subjects had neck pain, while 74% had headache, 51.5% had fatigue, 40.5% had warmth behind the ear, 58.5% had loss of concentration and 58.2% had depression on and off in the past six months. The associated musculoskeletal disorders in the subjects were myofascial disorder in 89.8% subjects, wrist tendinitis in 62.9% while 48.8% patients had low backache and 45.8% had De Quervain's syndrome.

Factors associated with neck pain and associated complaints: (Table 2): All subjects had neck pain, which was perceived more frequently as the daily time spent on personal computers increased ( $p=0.024$ ), in subjects who spent  $>1.5$  hours on computers without moving ( $p=0.034$ ) and those who used desktop as compared to those who used laptop or both ( $p=0.029$ ). Also neck pain was perceived more frequently in users of smartphones ( $p=0.033$ ) and tablets (0.028) as compared to other hand held devices and in subjects who operated these devices in sitting position. ( $p=0.05$ ). Headache was the most common complaint associated with neck pain, perceived by 74.1% of patients. It was significantly common in subjects who were students ( $p=0.001$ ), who used desktop as compared to those using laptop or both ( $p=0.01$ ) and in those watching television for more than 2 hours along with the use of other gadgets ( $p=0.038$ ). Fatigue was there in 50.2% patients and was more common in students ( $p=0.000$ ), in those who used personal computers for longer periods (daily more than 1 hour) ( $p=0.029$ ) and with prolonged use of hand held devices (daily more than an hour) ( $p=0.048$ ), those using smartphones ( $p=0.04$ ) and gaming devices ( $p=0.022$ ) as compared to other hand held devices along with long duration of daily television viewing ( $p=0.022$ ). Difficulty in concentration was perceived by 60.4% of subjects. It was more common in patients who used personal computers for more than 1.5 hours without moving but that was not significant statistically ( $p=0.06$ ) and in those used hand held devices predominantly for playing games ( $p=0.006$ ) or who used gaming devices (0.049). Dizziness was present in 58.5% of subjects and was significantly more common in females ( $p=0.001$ ) and patients aged 26-35 years ( $p=0.003$ ). Patients who predominantly used hand held devices for text messaging or gaming perceived frequent dizziness ( $p$  values = 0.030 and 0.000 respectively). Warmth behind the ear was complained by 40.5% of patients and was significantly common in females ( $p=0.04$ ) and in students or less educated subjects ( $p=0.000$ ). Depression was present in 26.9% of patients and was more common in patients using personal computers for longer duration (more than 1 hour) ( $p=0.011$ ) and in those using gaming devices ( $p=0.002$ ). Multinomial logistic regression analysis for factors associated with neck pain showed that duration of usage of PC and using it without moving for more than 2 hours, use of smart phones were closely associated with neck pain.

**DISCUSSION:** Prolonged use of computers and HHDs may have many ill-effects on human health.<sup>15</sup> Many studies have been done to evaluate these effects. Neck pain occurs due to forward flexion while looking down at the screens of mobile devices and texting for long periods of time. A positive relationship is suggested between neck flexion and neck pain with an increased risk if flexion of  $20^\circ$  or more is kept for more than 70% of studying or working time.<sup>7</sup> Our study shows that neck pain was perceived more frequently in users of smartphones ( $p=0.033$ ) and tablets (0.028) as compared to other hand held devices and in subjects who operated these devices in sitting position. ( $p=0.05$ ). The weight put on the spine increases when flexing the head forward at varying degrees. In neutral position it weighs 4.54-5.44 kg and when bent forward increases to 12.25kg at  $15^\circ$  and 18.14kg at  $30^\circ$  and further more with increasing angles of flexion.<sup>7</sup> The frequent forward flexion also causes changes in the cervical spine, curvature, ligaments, tendons, musculature as well as bony segments leading to pain in neck and associated areas.<sup>7</sup> The computers, wireless internet, cell phones and television emit low frequency electromagnetic field which can cause headache, dizziness, difficulty sleeping, ringing in ears, certain cardiac conditions and psychological conditions.<sup>7</sup> A high prevalence of mental symptoms has been reported in subjects using mobile devices and information technology as compared to those not using it.<sup>8</sup>

The use of computers involves typing on key board, dragging the mouse and such repetitive forceful exertions, awkward positions and localized contact stress cause upper limb cumulative trauma by overloading neck, shoulder arm and hand muscle and joints.<sup>3</sup> The muscles in the forearm that control the movement of fingers may become irritated and soft tissues become inflamed and swollen. Conditions like De Quervain's syndrome occur which are characterized by pain over radial styloid process and sometimes over

forearm and thumb which are caused by repetitive up and down movement of thumb while using the computer keyboard. The tendons of extensor pollicis brevis and abductor pollicis longus may become inflamed and swollen due to movement of thumb leading pain along the back of the wrist on the thumb side.<sup>3</sup>

As per our study pain was perceived more frequently as time spent on personal computers increased ( $p=0.024$ ), in subjects who spent  $>1.5$  hours on computers without moving ( $p=0.034$ ). These findings are similar to the study by De Vitta et al<sup>9</sup>, Torsheim et al<sup>10</sup> and Smith et al<sup>11</sup> where there was an association between use of computers or screen based activities and neck/shoulder pain in both the genders. Torsheim et al<sup>10</sup> have also reported an association between screen based activities and headache, a finding similar to our study. The systematic review by Xie et al<sup>12</sup> also showed close association between neck complaints in mobile device users with evidence that neck flexion, frequency of phone calls, texting and gaming were related to the musculoskeletal complaints. Straker et al<sup>13</sup> also reported close association between neck pain and computer use in adolescents. Fatigue was reported in 44.3% of surveyed cell phone users by Eapen et al<sup>14</sup> which was less than the finding in our study in which fatigue was reported in 50.2% of subjects. This could be due to the fact that the subjects in our study were possibly using multiple gadgets like mobile devices, computers and television. Also the study by Eapen et al<sup>14</sup> was done in 2010 when use of smartphones, gaming and social networking was not very common. In our study neck pain was perceived more frequently as time spent on personal computers increased ( $p=0.024$ ) and in subjects who spent  $>1.5$  hours on computers without moving ( $p=0.034$ ). This finding is different from the study done by Yeun and Han<sup>15</sup> where no significant associations were found between neck pain and the time spent on sitting on a chair for computer, gaming, study, etc. However, a significant association was observed in neck pain and use of smart phone, a finding which is similar to our study. The association between use of computer and neck pain in our study could be because 50.3% of subjects reported that the height of the computer screen is such that the eyes are above the midpoint of screen causing neck to flex for prolonged periods leading to neck pain.

A large proportion of patients have reported associated complaints like fatigue (50.2%), headache (73.1%), warmth behind the ear (40.8%) and difficulty concentrating (60%) and depression (26.9%). This could be due to exposure of low-level radiofrequency fields related to the electronic devices.<sup>2</sup> The association between mobile use and depression has been reported by Thomee et al.<sup>16</sup> and Diepenmaat et al<sup>17</sup> Limitations of our study were cross-sectional design and self-reported screen time which might introduce recall bias. As it was a cross-sectional study it was difficult to explain the causal relationship between neck pain and evaluated factors. However the study has helped identifying the associations. Further case-control and cohort studies can be done to confirm them.

#### CONCLUSIONS:

Prevention of neck pain with the computer and HHDs is possible by ergonomic corrections,<sup>18</sup> correct posture while using PCs,<sup>19</sup> taking frequent breaks while using PCs and limiting the total hours of usage of HHD.

**Table 1: Demographic characteristics of the participants (n=402)**

Variable	N (number)	% (percentage)
<b>Gender</b>		
Male	209	52
Female	193	48
<b>Age group</b>		
18-25years	113	28.1
26-35	289	71.8
<b>Hand dominance</b>		
Right	335	83.3
Left	67	16.7
<b>Level of physical activity /exercise</b>		
Light	121	34.6
Moderate	252	62.7
Heavy	29	7.2
<b>Type of HHD</b>		
Ordinary mobile phone	164	40.8
Smartphone	344	85.6

iPhone	32	8
Tablet	42	10.4
Gaming device	109	27.1
Any other	115	28.6
<b>Hours of personal computer usage/day</b>		
Not using	92	22.4
<1 hour	47	11.7
1-2hour	36	09
2hour-3hour	157	39.1
>3hours	72	17.9

<b>Hours of HHD usage/day</b>		
<1 hour	13	2.7
1-2hour	7	1.7
2hour-3hour	43	10.7
>3hours	339	84.3
<b>Hours of television /day</b>		
<1 hour	41	10.2
1-2hour	16	4
2-3hour	60	14.9
>3hour	285	70.9

**Table 2. Neck pain in subjects using electronic devices and its association with various factors.**

			Neck pain Less frequent	Neck pain More frequent	P-value Chi-square	P-value#
PC use time	Not using	90(22.4)	63	27	0.024*	0.011*
	>1hour	47(11.7)	38	9		
	1hour-2 hour	36(9)	24	12		
	2hour-3hours	157(39.1)	129	28		
	>3hours	72(17.9)	47	25		
P.C use without moving for more than 2 hours	Yes	144(35.8)	99	45	0.034*	0.000
	No	258(64.2)	202	56		
P.C type	Desktop	133(43)	40	173	0.029*	0.002
	Laptop	25(8)	7	32		
	Both	56(16.4)	10	66		
Posture while using HHD					0.05	0.057
Standing		102(25.4)	79	23	0.488	
Semi-reclining		208(51.7)	155	53	0.865	
Lying		182(45.3)	128	54	0.065	
Sitting		378(94)	279	99	0.035*	
Type of HHD						
	Smart phone	251	93	344	0.031*	0.002

#Multinomial logistic regression test applied

**REFERENCES:**

- Sharan D, Mohandoss M, Rangnathan R, Jose J. Musculoskeletal disorders of the upper extremities due to extensive usage of hand held devices. *Ann Occup Environ Med* 2014;26:22
- Al-Khlawi, Meo SA. Association of mobile phone with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population. *Saudi Med J* 2004;25:732-6
- Ming Z, Zaproudina N. Computer use related upper limb musculoskeletal disorders (Com RULM) *Pathophysiology* 2003;9:155-60.
- Ming Z, Narhi M, Siivola J. Neck and shoulder pain related to computer use. *Pathophysiology* 2004;11:51-56
- Green BN. A literature review of neck pain associated with computer use: public health implications. *J Can Chiropr Assoc* 2008;52:161-168.
- Shan Z, Deng G, Li J, Li Y, Zhang Y, Zhao Q. Correlational analysis of neck/shoulder pain and low back pain with use of digital products, physical activity and psychological status among adolescents in Shanghai. *PLoS ONE* 2013;8:e78109.
- Fares J, Fares M Y, Fares Y. Musculoskeletal neck pain in children and adolescents: Risk factors and complications. *Surg Neurol Int* 2017;8:72.
- Aggarwal, K.K. Twenty-six percent doctors suffer from severe mobile-phone induced anxiety: Excessive mobile phone can be injurious to your health. *Indian Journal of Clinical Practice* 2013;24:7-9.
- De Vitta A, de Melo Trize D, Fiorelli A, Carnaz L, De Conti MHS, Simaao SF. Neck/shoulders pain and its relation to the use of tv/computer videogame and physical activity in school students from Bauru. *Fisioter Mov* 2014;27:111-8.
- Torsheim T, Erriksson L, Schnohr C W, Hansen F, Bjarnason T, Valimaa. Screen-based activities and physical complaints among adolescents from Nordic countries. *BMC Public Health* 2010;10:324.
- Smith L, Luow Q, Crous L, Grimmer-Sommers. Prevalence of neck pain and headaches: Impact of computer use and other associative factors. *Cephalgia* 2009;29:250-7
- Toh SH, Coenen P, Howie EK, Straker LM. The associations of mobile touch screen device use with musculoskeletal symptoms and exposures: A systematic review. *PLoS ONE* 2017;12:e0181220.
- Straker L, O'Sullivan, Kendall G, Sloan N, Pollock C, Smith A et al. IT kids: Exposure to computers and adolescents' neck posture and pain. CD-ROM proceedings of the International Ergonomics Association Triennial Congress 2006; 2006 July 10-14, Maastricht (Netherlands)
- Eapen C, Kumar B, Bhat A. Prevalence of cumulative trauma disorders in cell phone users. *J. Musculoskelet. Res* 2010;13:137.
- Yeun Y R, Han S. Factors associated with neck /shoulder pain in young adults. *Biomedical Research* 2017;28:7117-21.
- Thomee S, Harenstam A, Hagbrg M. Mobile phone use and stress, sleep disturbances, symptoms of depression among young adults-a prospective cohort study. *BMC Public Health* 2011;11:66
- Diepenmaat ACM, van der Wal MF, de Vet, Hirasig RA. Neck/shoulder, low back, and arm pain in relation to computer use, physical activity, stress and depression among Dutch adolescents. *Pediatrics* 2006;117:
- Gulraiz, Quratulain, Afzal F, Manzoor S. Chronic neck pain and how to prevent chronic pain in bankers by using ergonomics. *J Nov Physiother* 2017;7:5
- Abdelhameed AA, Abdel-azeim AA. Exercise training and postural correction improve upper extremity symptoms among touchscreen smartphone users. *Hong Kong Physiotherapy Journal* 2016;35:37-44